

## Space Weather Forecast

Issued on Saturday, 08 June 2024 at 12:02 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

**Space Weather Forecast Headline: Falling chance of major solar radiation storm (S3). Moderate geomagnetic storm (G2) now likely in UTC day of Monday 10 June. Minor/Moderate (R1/R2) radio blackouts expected, risk easing into new UTC week.**

### Analysis of Space Weather Activity over past 24 hours

**Solar Activity:** Activity has been moderate during the last 24 hours, with occasional Moderate-class flares, peaking with a high end event from a complex sunspot region in the southwest at 08/0149UTC. This event generated a Coronal Mass Ejection (CME). MOSWOC Enlil modelling suggests a crossing time of Earth's orbit at 10/0600UTC, i.e. the start of the UTC day Monday 10 June. No other new CMEs were noted in the period.

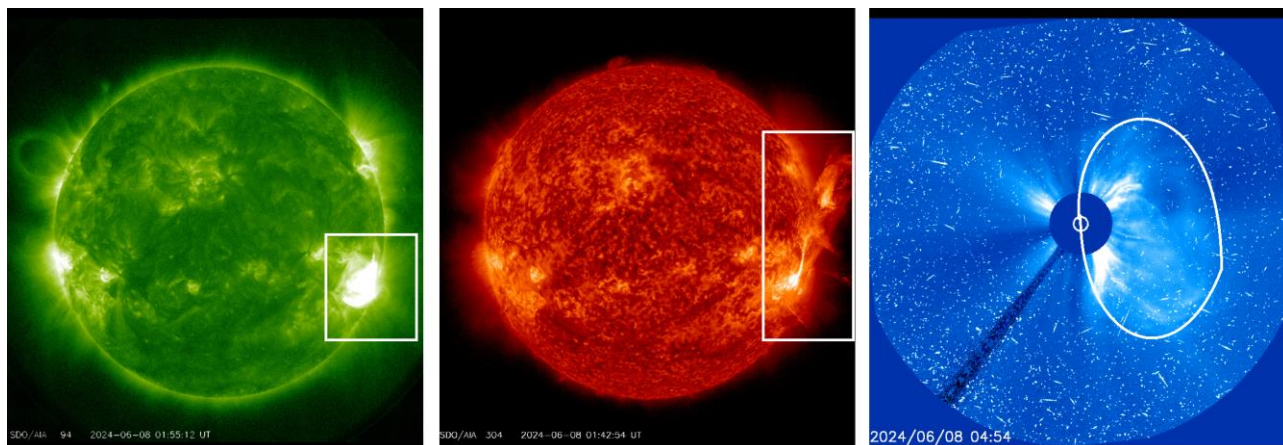


**Figure 1: Various views of the 08/0149UTC Moderate-class X-ray flare from the complex southwestern sunspot – respectively near X-ray wavelengths of light (green), extreme UV (red) and a third zoomed-out perspective showing the CME heading rightwards but with an intersection with the centre line. Note also the particle ‘snow’ from the ensuing S3 major solar radiation storm on the final image (bright points and streaks in addition to fainter point sources from background stars).**

There are currently up to ten sunspot regions on the facing side of the Sun. The apportionment for the far southeastern regions not yet clear, but an arriving region may now cover a significant span and is one to watch in the coming week. The most active region on the disc remains a large and complex group in the southwest, with this group showing gradual reconfiguration of its constituent parts. Less clearly, the group now may also showing rapid development of some small leading spots. Otherwise, main changes observed in recent hours have been a reduction in number and area of three further groups' intermediate spots.

**Solar Wind / Geomagnetic Activity:** Solar winds showed CME influence (with an uncertain causative event, but probably originating around the middle of the past week) for much of the 24-  
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hour period (starting 07/1050UTC). Solar wind speeds were slightly elevated throughout, with the number of particles similarly slightly elevated before undergoing a slight waning. The magnetic field trace showed an erratic magnitude that peaked at Moderate levels, with the north-south component varying and spending the first few hours of the current reporting period anti-aligned with Earth's field (to greater geomagnetic effect).

The net result of the above solar wind measures was for a reduction from provisional G2 moderate geomagnetic storm conditions entering the 24 hours, falling to become approach quiet later in the period.

**Energetic Particles / Solar Radiation:** Solar radiation levels showed a rapid rise in the wake of the large Moderate-class flare, with 10MeV protons rising to an eventual peak of 1030pfu (1000 being S3 - major solar radiation storm) at 08/0800UTC before waning slightly. 100MeV protons also showed a rise to a peak of around 8pfu before these too began to wane (alerts are issued for 100MeV protons breaching 1pfu).

## Four-Day Space Weather Forecast Summary

**Solar Activity:** Further Moderate-class flares are now expected, with an ongoing slight chance of Strong-class flares - these most probably from the sunspot regions in the far southeast and far southwest. The probabilities of both fall slightly by the very end of the four days as a result of the passing from the facing side of the westernmost of these groups.

**Solar Wind / Geomagnetic Activity:** The CME associated with the 08/0149UTC Moderate-class flare shows an 'asymmetric halo' in its shock at least (off-centre expanding ring of material, i.e. at least partially at the observer), and there is now considered a risk of G2 moderate geomagnetic storm conditions through Monday 10 June. This is the only CME in the forecast.

Otherwise, current slightly elevated solar winds should slowly ease on day 1 (Saturday 08 June). A coronal hole in the northwest could bring renewed slightly elevated or possibly elevated wind speeds for a time later in the current UTC day (08 June), or perhaps more likely into day 2 (09 June).

There is a slight chance of Minor geomagnetic storm G1 in the next 24 hours - should any coronal hole fast wind onset occur. Moderate geomagnetic storm G2 is then likely on Monday 10 June before waning to quiet by the end of the four-day period.

**Energetic Particles / Solar Radiation:** High energy proton flux should now show a very gradual waning tendency from its S3 major solar radiation storm peak, although proximity to this level means that any further suitable events from the western sunspot group may see the trace rise once again. Moderate solar radiation S2 is therefore expected at first, with a chance of S3, falling to an expected minor S1 into Sunday 09 June. The risk should fall further to near background by Tuesday 11 June.

## Geomagnetic Storms:

| Geo-Magnetic Storm       | Level    | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|--------------------------|----------|------------------------|-------------------|-------------------|-------------------|-------------------|
| Probability (Exceedance) |          |                        | (%)               | (%)               | (%)               | (%)               |
| Minor or Moderate        | G1 to G2 | Yes                    | 5                 | 10                | 70                | 1                 |
| Strong                   | G3       | No                     | 1                 | 1                 | 10                | 1                 |
| Severe                   | G4       | No                     | 1                 | 1                 | 1                 | 1                 |
| Extreme                  | G5       | No                     | 1                 | 1                 | 1                 | 1                 |

## Radio Blackouts - X Ray Flares:

| X Ray Flares | Level         | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|--------------|---------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| Probability  |               |                        | (%)               | (%)               | (%)               | (%)               |
| Active       | R1-R2 M Class | Yes                    | 80                | 80                | 80                | 60                |
| Very Active  | R3 to R5 X    | No                     | 15                | 15                | 15                | 10                |

## Solar Radiation Storms - (High Energy Protons):

| Radiation Storms         | Level (cm <sup>-2</sup> sr <sup>-1</sup> s <sup>-1</sup> ) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|--------------------------|------------------------------------------------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
| Probability (Exceedance) |                                                            |                        | (%)               | (%)               | (%)               | (%)               |
| Active                   | ≥ S1                                                       | Yes                    | 100               | 80                | 30                | 20                |
| Very Active              | ≥ S3 *                                                     | Yes                    | 30                | 20                | 5                 | 5                 |

\* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = cm<sup>-2</sup>sr<sup>-1</sup>s<sup>-1</sup>)